Oxide Semiconductors for Water Purification Using Sunlight

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Intensive research aims at the development of water purification technology, which allows removal of organic pollutants and microbial agents from water using sunlight. The present work reports the research strategy in the development of oxide semiconductors for the conversion of solar energy into the chemical energy required for oxidation of organic compounds, including bacteria, viruses and alternative organic compounds in water [1, 2]. The research aims at optimization of the key performance-related properties (KPPs), including: (i) maximization of light absorption, (ii) reduction of charge recombination through enhanced charge separation, (iii) enhancement of charge transport and (iv) enhancement of charge transfer. The ultimate aim of the R&D program is to maximize system performance in water purification using sunlight as the only driving force in the process of water treatment. It has been documented that all these KPPs are determined by defect disorder [3]. Therefore, defect engineering may be applied in optimization of the KPPs. The research program involves the studies on the characterization of the low-dimensional surface structures, which are predominantly responsible for solar energy conversion [4]. The present work will report the effect of defect disorder on the KPPs for TiO_2-based semiconductors.

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